

CASE REPORTS

ACONITINE-INDUCED CARDIAC ARRHYTHMIA

BY

GEOFFREY FFRENCH

From the Queensway General Hospital, and the Oakville-Trafalgar Memorial Hospital, Toronto

Renewed interest in the pharmacological action of aconitine has followed the work of Sherf (1947), Prinzmetal *et al.* (1950 and 1951), and Brown and Acheson (1952).

Its use in experimental medicine produces stimulus formation in the dog's heart with auricular tachycardia and in certain circumstances ventricular tachycardia and fibrillation: it has become a useful tool in the hands of the research cardiologist. On the other hand though it has long been used by physicians both externally and internally, there is very little information as to its effect upon the human heart and circulation. Such as there is has been confined to the observation of the pulse rate and character. Hartung (1930) described electrocardiographic changes in a case of aconite poisoning which demonstrated a sinus bradycardia and first degree heart block; since then no further evidence has been published and it is the purpose of this communication to report a case with unequivocal evidence of the relation of the drug to the arrhythmia. Before doing so, some facts about this interesting alkaloid may be useful.

Materia Medica

Aconitine and its allied alkaloids (aconine and benzaconine) are the active principles of *Aconitum napellus* whose synonyms, Monkshood, Wolfsbane, Jacob's chariot, etc., are well known and comprise a number of sub-species; it is a perennial tuberous root growing wild in the mountainous districts of Europe and Asia, the commercial supplies coming from Western Europe.

In modern times aconite has been used principally for its dual effects; it has a peripheral action in stimulating sensory nerve endings in the skin and mucous membranes and has been used for many years as a counter-irritant: there is still a preparation in the British Pharmacopœia, Linimentum Aconitum but the danger of its systemic effects has led to its gradual disuse. These effects, mainly stimulation of the medullary vagal centres with slowing of the heart and lowering of the blood pressure were also utilized in the treatment of fevers, usually in the form of tincture of aconite. The masterly accounts in Taylor's Jurisprudence (Smith, 1948) of deaths by suicide and homicide in the 19th century when the drug achieved some popularity, are unique.

The classical symptoms of aconite absorption and intoxication are shared only to a much less degree by veratrine. Tingling and numbness of the tongue occur shortly after ingestion and these symptoms persist and extend to involve the whole body, accompanied by acute restlessness, vomiting, shock, muscle twitchings, and convulsions; many of the reported cases have exhibited trismus. Veratrine has only a slight tingling effect which does not persist. The pulse is at first slow but later becomes rapid and irregular; the blood pressure falls and death occurs from respiratory paralysis and ventricular fibrillation. The persistent numbness and tingling is apparently characteristic of aconite intoxication and its recognition is therefore of cardinal importance.

The minimum lethal dose has been as low as 1/50 of a grain (1.2 milligrams) of the pure alkaloid aconitine (Smith, 1948) but when considering toxic doses the admixture of allied alkaloids must be kept in mind, and their presence has often been confusing to the analyst. When recovery occurs, the effects of intoxication may persist for several weeks, with great muscular weakness, paræsthesiae, numbness, tingling, and formication. By reason of its vagal inhibiting effect, the most useful antidote is atropine, but all methods must be used to combat shock including circulatory stimulants and oxygen. It can be neutralized in the stomach by tannic acid followed by charcoal (Martindale, 1952).

Case Report

A laboratory technician, aged 32, consumed on 17/12/55 200 mille-litres of an infusion of what he thought was *Echinacea angustifolians*, after his wife, to whom he had offered it, had refused to

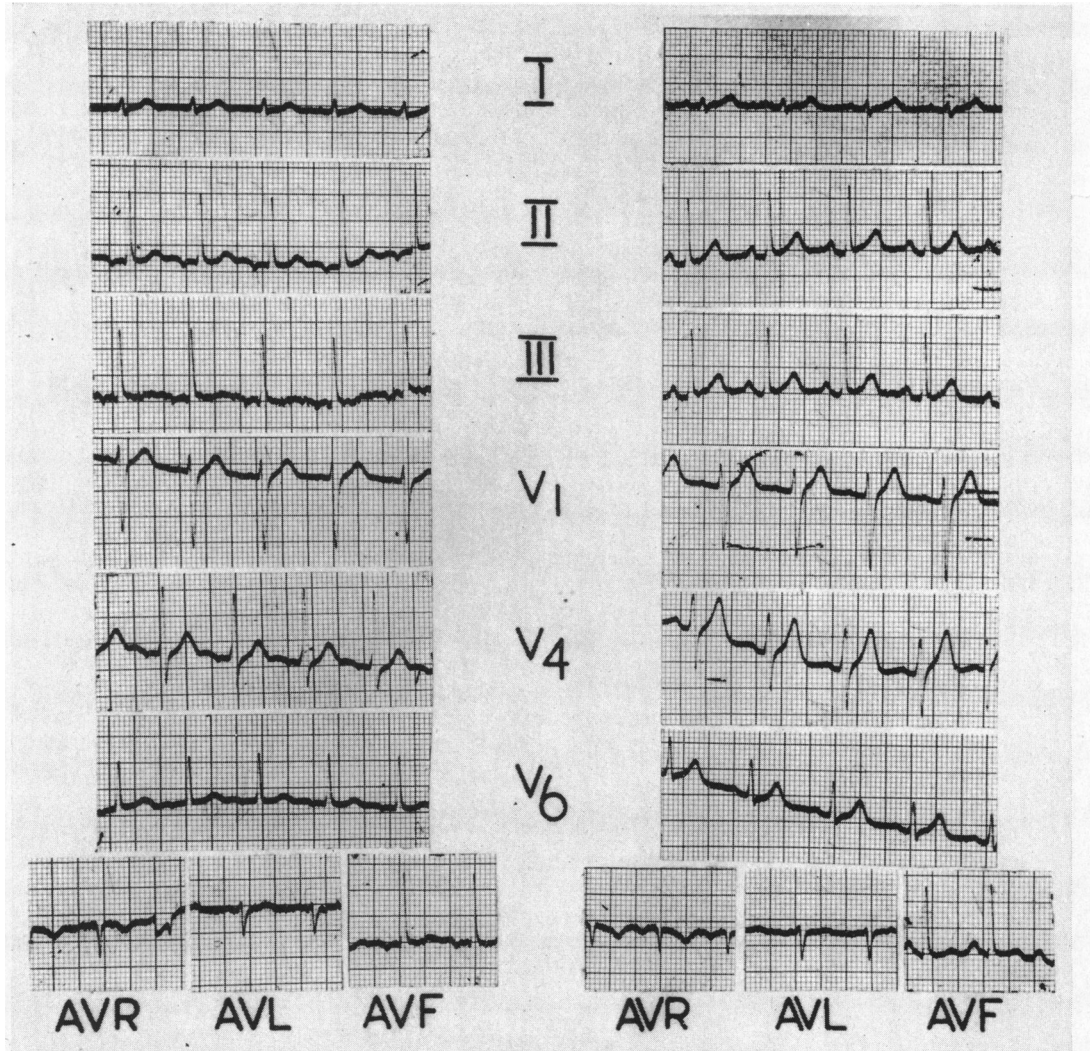


FIG. 1.—(A) Electrocardiogram of 18/12/55, showing auricular tachycardia at 115 a minute. (B) Electrocardiogram of 22/12/55, showing return of sinus rhythm at 100 a minute.

drink any more because it made her tongue numb. She had had symptoms of lower abdominal pain earlier in the day and her husband had made the infusion originally for her relief. He had been in the habit of drinking similar infusions for the past few years, mainly as a tonic to "thicken the blood." Two and a half hours later he began to have difficulty in getting his breath and rapidly became cyanosed and shocked, with a rapid faint pulse and a systolic blood pressure of 60 mm. Hg. He was removed at once to hospital where he was given warmth and oxygen. By this time he was complaining of abdominal cramps and was vomiting repeatedly. He said his whole tongue and body felt numb and tingling and he complained increasingly of this together with great muscular weakness. In view of his history of taking a herbal infusion and the numbness complained of both by his wife and himself, the possibility of aconitine or veratrine poisoning was considered, these being the only drugs known to have such an effect. Atropine, 1/60 of a grain (1 mg.) was given intravenously and methedrine 15 mg. intravenously and 15 mg. intramuscularly, after which the blood pressure rose to 80/60 with temporary relief of cramps and weakness; these symptoms returned

after half an hour when the blood pressure had again fallen to 60 mm. Hg. A further 30 mg. of methedrine was given intramuscularly and from then on the state of shock gradually lessened; the vomiting decreased and it was possible to achieve gastric lavage with sodium bicarbonate and leave activated charcoal in the stomach. The pulse all this time was extremely fast, even prior to the atropine. He was sent to the ward with a blood pressure of 100/60 still complaining of numbness of tongue and body: his speech was thick as if his tongue was too big, and he had great muscular weakness with absent reflexes but no other abnormal signs.

He had recurrent bouts of abdominal cramp and vomiting during the night but his general condition gradually improved and by the following morning his blood pressure was 110/70. He still had tachycardia and the electrocardiogram showed an auricular tachycardia of 115 a minute (Fig. 1). He remained in hospital four days, with gradual lessening of all symptoms and was discharged apparently fully recovered although his pulse was still 100 a minute. A repeat electrocardiogram on the next day showed a return to normal rhythm with a sinus tachycardia of 100. Over the next few days the heart settled to between 70 and 80; his subsequent progress has been excellent and he returned to work one week after discharge from hospital and has remained well to date (October, 1956).

Pharmacological Identification and Assay. By Dr. R. M. Baxter, Ph.D., Faculty of Pharmacy, University of Toronto. The sample of drug was identified as containing aconite root and assayed 0.44 per cent of total alkaloids calculated as aconitine. The alkaloid aconitine was isolated and identified: the melting point was 194° centigrade with decomposition. The fluid taken by the patient, when assayed, revealed that it contained 22 mg. per 100 ml. (0.022%) of alkaloids. The patient was thought to have consumed 200 ml. of the infusion, that is 44 mg. of total alkaloids.

This patient was known to be in the habit of taking herbal infusions when unwell. After information from the family doctor that the patient was acutely ill, inquiries were made as to whether he had taken any herbs; and on this being confirmed aconite poisoning was suspected and the measures taken early in his illness probably contributed to his recovery. There is little more to be said except that this case re-emphasizes the possible danger of herbal medicines prepared from unknown sources.

Summary

A report is made of a case of aconite poisoning with recovery. Electrocardiographic studies revealed an interesting arrhythmia which reverted to normal. A brief review of the drug is given.

My thanks are due to Dr. Zaborowska, the patient's medical attendant, and to Dr. R. M. Baxter and Dr. George Walker, of the Faculty of Pharmacy, University of Toronto.

References

- Brown, B., and Acheson, G. (1952). *Circulation*, **6**, 529.
Hartung, E. F. (1930). *J. Amer. med. Ass.*, **95**, 1265.
Martindale. (1952). *Extra Pharmacopæia*. 23rd ed., vol. 1, London.
Prinzmetal, M., Corday, E., Brill, I. C., Sellers, A. L., Oblath, R. W., Flieg, W. A., and Kruger, H. E., (1950). *Circulation*, **1**, 241.
—, —, Oblath, R. W., Kruger, H. E., Brill, I. C., Fields, J., Kemamér, S. R., Osborne, J. A., Smith, L. Allen, Sellers, A. L., Flieg, W., and Finston, E. (1951) *Amer. J. Med.*, **11**, 410.
Scherf, D. (1947). *Proc. Soc. Exp. Biol. and Med.*, **64**, 233.
Smith, Sydney (1948). *Taylor's Principles and Practice of Medical Jurisprudence*. 10th ed., p. 636. London.